2003 Craftsmanship Award Recipient

Robert J. Reminder

For personal involvement with the development of the duplication of complex ice shapes using advanced aerospace composite materials

NASA Glenn Research Center has had a robust aviation safety program based on aircraft icing. One of the premiere icing facilities in the world is the Glenn Icing Research Tunnel. For years this facility in conjunction with Department of Defense, the commercial aviation industry, and NASA have performed cutting-edge research in the area of ice formation on aircraft control surfaces.

The time constraints of working with the ice shapes generated during tunnel testing required the development of a process to extend the study time of these complex ice shapes. Working directly with the researchers, Mr. Robert J. Reminder developed the process to meet those requirements.

Mr. Reminder has been a wood modelmaker for over 30 years and has diligently provided exact replicas of a wide variety of ice shapes in support of the Aviation Safety Program at the Center. This involved designing, developing, and manufacturing the ice shape molds that would be used to produce the ice shape prototypes. These shapes would generate valuable research data to the general and commercial aviation community. Using an advanced aerospace composite to accurately duplicate the actual ice buildup, and a process called silicon molding, he is able to painstakingly reproduce the large and diverse variety of ice shapes that effect the ability of pilots to operate aircraft safely.

His expertise in silicon molding has enabled the research engineering community to achieve significant research milestones and revolutionary leaps in aviation safety. The process to reproduce the exact ice shape generated in the icing tunnel is a tedious and exacting method. His ice shapes are within 95 percent of the net shape of the ice formation. The data taken from these shapes has been used to significantly improve aircraft safety worldwide.

2003 Craftsmanship Award Recipient

Nicholas C. Varaljay

For the innovativeness, analytical and problemsolving ability, thoroughness, and refined craftsmanship displayed in microelectromechanical systems (MEMS) technology

Mr. Nicholas C. Varaljay has provided outstanding electronic technician design, fabrication, and development support to the Communications Technology Division to advance the state-of-the-art MEMS technology at the NASA Glenn Research Center. He has led the successful fabrication of the first microwave cantilever.

He continually provides recommendations and derives new developmental laboratory and fabrication processes to redefine procedures to ensure the advancement of MEMS technology in the Communications Technology Division. Advancements include

(1) Fabrication of first phase shifter on ferroelectric using sol-gel processes from University of Puerto Rico
(2) Fabrication of 16 phased-array antennas using ferroelectric film on magnesium oxide substrate
(3) Fabrication of linear resonators on double-sided high-temperature superconductor (HTS)
(4) Consultation on SiGe Project

Mr. Varaljay has been acknowledged as a co-author in numerous MEMS engineering papers and abstracts at Glenn. He has been acknowledged by the Electron Device Technology Branch for his developmental support of the novel Ka-band MEMS reconfigurable bandpass/bandstop switching networks. Additionally, he has been recognized in the book titled “Co-Planar Waveguide Circuits, Components, and Systems.”

2004 Craftsmanship Award Recipient

Bruce Viergutz

For innovativeness and craftsmanship in work related to ferroelectric reflectarray antenna development

Bruce Viergutz serves as senior electronic engineering technician in support of the Electron Device Technology and Applied RF Technology Branches. The focus of this work is to develop advanced electronic technologies to meet the space communication needs of NASA and industry. His work requires extensive contact and interaction with world-renowned research professionals in network architecture, design, analysis, and development for satellite and antenna systems. The objective of the reflectarray antenna is to serve as a low-cost antenna in low-Earth-orbit applications.

Bruce has the ability to conceive and perform complex installations, testing, and troubleshooting of unique experimental equipment such as

- Pulsed laser ablation
- Cryogenic hall measurement unit
- Rubylith cutting plotter
- Atomic network analyzer
- Spectrum analyzer
- Photolithography

Bruce is required to plan, organize, fabricate, and design advanced printed circuits—these tasks include the mask layout and lithography processes—in order to resolve complex design concepts of coplanar transmission lines, microwave integrated circuits, and micromachined sensors and microelectromechanical systems (MEMS).

2004 Craftsmanship Award Recipient

Parametric Inlet Team

Philip R. Bastian
Philip M. Beck
Gregory C. Blank
Chris J. Conrad
Dale T. Dragony
Ralph P. Fekete
Jose E. Gonzalez
Robert L. Hauer
Richard A. Kelsch
Carol D. Laverne
Jesus M. Lopez
Steve M. Miller
Richard D. Minter
Jerome Priebe
Adam M. Redding
Patrick Spanos

For the innovative approach to designing and fabricating the pressure rakes, instrumenting ramps, and cowls for the Parametric Inlet

The waverider inlet concept is a novel approach to a supersonic external compression inlet design. With the cancellation of the High-Speed Research (HSR) Program, the effort has been transferred to the Aeronautics Base Program. The initial effort at Glenn Research Center is to be focused on a Parametric Inlet model. The objective of the waverider Parametric Inlet effort is to investigate the design space and determine performance and operability. The conceptual design will be closely coupled to CFD (computational fluid dynamics) flow analysis. Data from analytical techniques and wind tunnel testing will be reported to quantify Aeronautic Base Program inlet metrics for the waverider concept. The planned approach will center on the development of a parametric model for the Glenn 10- by 10-Foot Supersonic Wind Tunnel. This is a collaborative effort through the Aerospace Test Article Development (ATAD) Co-op that includes NASA Ames, Dryden, Langley, Marshall, Goddard, and Glenn centers. NASA Glenn is primarily responsible to manufacture and instrument the aft ramp, forward ramp, and cowls.

The task was to fabricate the hardware from computer solid models and to instrument the hardware with pressure sensors. The hardware was of very unusual design, consisting of unique angles and contours and tight tolerances. The tolerances were ±0.005 in. as compared to ±0.01 in. currently used in the aircraft industry. The precision machining group was responsible to develop the computer-aided manufacturing (CAM) programs and to manufacture the contour geometries from the computer models and fixtures. The instrumentation group was responsible to fabricate unique fixtures and pressure rakes and skillfully install countless number of tubing on and through the contour surfaces of the ramps and cowls. The pressure sensor systems include 400 static, corner rakes, and commercial-off-the-shelf microelectromechanical system (MEMS) sensors. The advantage of the MEMS sensor is that it produces instantaneous and accurate pressure measurements.

The main difficulty of the precision machining task is to machine 800 lb of forged aluminum block down to 36 lb of exotic contoured geometry for the forward ramp without any warping. Forged aluminum is less stable making it difficult to machine as compared with cast aluminum that is easy to machine. However, forged aluminum is much stronger in terms of tensile force as well as static and dynamic load testing. The main difficulty of the instrumentation task is to machine, fabricate, and install the suite of pressure sensors under an aggressive schedule while accommodating numerous design changes. Significant research was conducted to identify the appropriate MEMS sensors. In addition, interface and fixtures to accommodate the MEMS were designed and fabricated.

The precision machining group's specific contribution includes using CAD (computer-aided design) to design the contour geometries and to design the fixtures to hold the parts in order to fabricate the ramps and cowls. Machines utilized were the Makino (high-speed milling machine), the Cincinnati Gilbert (five-axis drilling and milling machine that only three people can operate), and the Monarch (NC mill). The instrumentation group's specific contribution includes programming the wire electric discharge machining (EDM) and numerically controlled (NC) mill machines to fabricate the required fixtures to hold the parts in order to make several different types of pressure rakes for the ramps and cowls.

2005 Craftsmanship Award Recipient

John Brodkowski

In recognition of the leadership and innovative approach to designing, fabricating, and installing the instrumentation sensors for the T–700 Active Stall Control Engine Demonstration program

The manufacturing task was to modify the engine and install instrumentation for the Active Stall Control Engine Demonstration (ASCED) program. This was the first attempt to incorporate this technology into a small turbine engine, and the T–700 engine that was selected has different aerodynamic and geometric properties than in rig tests previously performed. Hence, there is a technical challenge to both incorporate this stall control package and instrumentation into the engine and also uncharted territory for use of this technology in the T–700 compression system.

John Brodkowski has made a significant contribution to this project and has brought an extensive background in small part machining and instrumentation fabrication. Without his assistance this project would not have been successful. Specifically, Mr. Brodkowski custom fit the control rods into the centrifugal stage diffuser passages, which required intricate work in a small area to blend them to the existing passage contour for a flush fit when retracted. His successful accomplishment enables an undisturbed flow path when retracted and the desired flow disturbance when extended into the flow passage. He also fabricated prototype and flight rakes for measurement of total pressure and temperatures in the axial compressor exit area. The rakes were successfully qualified at the Structural Dynamics Laboratory without any reworking. He has brazed 18 air-injection supply tubes to the engine, which required precise alignment in order to avoid interferences with existing engine hardware. He instrumented the centrifugal stage diffuser and casing with over 100 static pressure measurement taps. He also custom fit several air injectors into the compressor casing to eliminate any flow disturbances and bonded them in place. He has instrumented the axial compressor casing with high response and steady state static pressure measurement tubes, which required extensive adjustments to routing to avoid interferences with existing engine hardware.

As this was an existing engine, there were many difficulties that arose from interferences of new research hardware with existing engine hardware. When possible, existing engine hardware was relocated or modified. When that was impractical, adjustments were made to research hardware and instrumentation. John was instrumental in making these adjustments.

With the location of over 100 static taps in the diffuser, John identified that hand brazing was impractical and suggested furnace brazing instead. He installed and routed the tubes in the diffuser in preparation for furnace brazing. A ceramic filler material for sealing the pass-through passages for instrumentation was also researched and recommended. This is a new product that has high-temperature and high-pressure properties but is able to be applied by hand, flow freely, and cure at room temperature. He even arranged for the supplier to perform a trial on a sample piece to ensure the applicability to the project.

John encountered material incompatibility when we needed to strap stainless steel instrumentation tubes down to the front frame of the compressor. He developed a bonding technique with a woven metal base to which the tubes could be spot welded.

Mr. Brodkowski has demonstrated innovative fabrication and machining techniques as well as technical leadership on this project.

2005 Craftsmanship Award Recipient

RATTLRS Inlet Manufacturing Team

Kenneth Guinta
Herbert A. Lawrence
Richard Minter

For creativity and excellent contributions in the fabrication of the Revolutionary Approach to Time-Critical Long Range Strike (RATTLRS) supersonic inlet

The task was to fabricate a supersonic inlet model to be tested in the 1- by 1-Foot Supersonic Wind Tunnel. The inlet has the shape of a revolved parabolic profile with two rectangular openings at the bottom. This inlet will be mounted to other parts that will be used to measure pressure distribution over the inlet surface. The inlet is the most important part of this test.

Herbert Lawrence was the rapid prototype technician that created the inlet from a solid model. He had to develop a process to fabricate the part. It was decided to use metal selective laser sintering (SLS) because the geometry of the part was difficult to manufacture using conventional machining methods. Mr. Lawrence had to overcome many difficulties since SLS using metallic materials was new here at Glenn. Later, he discovered that the new oven was not distributing the heat evenly inside, which led to parts not being infiltrated completely. He had to work around that by splitting the part in three sections.

Kenneth Guinta machined, polished, and assembled the inlet components. He had to machine the parts carefully to meet the test requirements. It was required that the leading edges be sharp and thin. Mr. Guinta did not have much information on the behavior of this metallic material—LaserForm A6 steel—under different manufacturing processes (brazing, welding, machining, etc.). He had to improvise and be cautious to avoid any warping, cracking, or breaking of the material. He polished the inlet surface and matched the mating surfaces of each part to seamless finish. Mr. Guinta also had creative ideas on how to handle, attach, and machine the inlet without problems.

Richard Minter had the task to install 59 instrumentation tubes on the inlet model that would measure static pressure and dynamic pressure. The amount of tubes was requested by the principal investigator (PI). Mr. Minter also never worked with the LaserForm A6 steel before. He practiced and tested installing the instrumentation tubes on this steel using a previous version of the model. He found out that the material was very hard to drill and lost several small drill bits in the process. Mr. Minster had to use the best of his skills to install instrumentation tubes in small regions where the PI requested many tubes or where the wall thickness was very small. He used two sizes of tubes: 0.040 and 0.060 in. Also, he had to be careful when connecting the small tubes to the delicate electronic pressure scanners that needed to be installed inside the upper inlet's cavity. Mr. Minter had very little room to work with inside the inlet.

This task gave Mr. Lawrence, Mr. Guinta, and Mr. Minter the opportunity to show how creative and resourceful they can be when presented with new challenges.